

## NOTES ON THE HABITATS OF SOME NORTH AMERICAN TIGER BEETLES

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The Cicindellidæ have long fascinated entomologists, not only for their beauty and taxonomic interest, but for the excitement of their capture. Thus, much has been published on where and under what conditions different species were taken and how they reacted to pursuers. Previous field notes on the habits and habitats of tiger beetles proved very helpful to my husband and me on two collecting trips for the American Museum of Natural History, one to the southwestern United States in 1948 and one to the north central states in 1949. Such notes can also be valuable in the systematics of *Cicindela*, since some species and subspecies are confined to certain definite types of habitat.

The present notes pertain to the 1949 trip, which was expressly for tiger beetles. The area covered included Iowa, Nebraska, eastern, southern and western Wyoming, extreme northwestern Colorado, northeastern Utah, western and northern Montana, North and South Dakota, and southern Alberta and Saskatchewan, Canada. We traveled 12,000 miles and did intensive collecting for ten weeks, from the middle of June to the end of August. Seven thousand tiger beetles were secured in well over a hundred localities.

There were three general habitats that almost always produced tiger beetles: 1. sand hills, pits, dunes, or blowouts; 2. alkali flats or lakes; 3. river sand banks or sand bars. Other places where the beetles might be found were shores of fresh water lakes, provided they were not too grassy or too stony; hills or prairies of sparse, short grass; gravel or clay pits or gullies; and small roads or paths in the woods. In these latter situations, tiger beetles, if present, were seldom numerous.

In the general habitats enumerated above, tiger beetles were generally found in specific parts of the area, such as near or away from the vegetation or water, on dry, wet, hard packed or loose soil, on the flat or on slopes. Where they were very abun-

dant they often spread over the entire habitat and it was then sometimes difficult to judge what parts they preferred.

Typical species found under habitat 1 are, generally speaking: *formosa*, *lengi*, *lepida*, *limbata*, and *scutellaris*; under 2, *carthagena*, *circumpicta*, *fulgida*, *nevadica*, *togata*, and *willistoni*; under 3, *cuprascens*, *hirticollis*, *macra*, *oregona*, and *repanda*.

The three species with the most varied habitats were *punctulata*, *repanda*, and *tranqueberica* and they were taken, as might be expected, at more localities than any of the others, although not necessarily in larger numbers.

Nine of the 26 species were taken at night: *circumpicta*, *cuprascens*, *lepida*, *limbata*, *macra*, *nevadica*, *punctulata*, *repanda*, and *togata*. We did not, however, collect at night in every locality and possibly others might have come. But the following species were not found at night, even though they were present in daytime at the same spot: *formosa*, *fulgida*, *hirticollis*, *lengi*, *purpurea*, and *scutellaris*.

For convenience, the species are arranged alphabetically. The terms gregarious and solitary are relative and apply to the species only as we found them.

*Cicindela carthagena*—gregarious—taken in northwestern Wyoming on the banks of small streams running through strongly alkali, gravelly soil. The beetles were usually in the open, but occasionally in short, sparse grass.

*Cicindela circumpicta*—gregarious—taken in Lincoln, Nebraska, only, on the muddy alkali shores of the Salt Basin Lake, either on the damp bare spots between clumps of vegetation or out in the open on the somewhat dryer bars. They were very numerous and a few even extended into a corn field a couple of hundred feet from shore.

At night, when a lantern was set down in small open spots, within a few seconds the beetles began running towards it, coming from the vegetation on all sides.

Seen apparently mating in June.

*Cicindela cuprascens*—gregarious—taken in Iowa on the Missouri River, in central Nebraska, southwestern South Dakota, eastern Wyoming, and south central North Dakota.

The moist edges of river shores or sand bars seemed to be the

preferred habitat of *cuprascens* and it was always encountered at least in the vicinity of water. A few individuals at Council Bluffs, Iowa, were found 50 to 75 feet from the water on a dry sandy path leading to the river and bordered by sparse vegetation.

In the middle of sand bars, at night, many specimens were captured by hand, when they were surprised in the light of a moving lantern. They also came to the light when it was put down near the vegetation at the back of the beach. Only one or two could be found near the water's edge at night.

Pairs were taken in June and July.

*Cicindela cursitans*—not gregarious—taken at Council Bluffs, Iowa, only, on moist caked loam, near tall grass, in the entrance driveway to a sand pit under tall bluffs.

*Cicindela decemnotata*—not gregarious—taken at Fort Bridger, Wyoming, only, among grass and stones on the shore of a new reservoir (1949) and below the reservoir on barren alkali ground at a large seepage area.

*Cicindela duodecimguttata*—gregarious—taken in Iowa, eastern and western South Dakota, northeastern Wyoming, northern Montana, northern and central North Dakota, and southern Saskatchewan.

It is difficult to generalize on the habitat of this species since it was taken in such a variety of places and usually in small numbers. Perhaps it was found more often in somewhat damp, muddy situations near water, yet it occurred also on dry, gravelly or sandy shores, or even far from water, as on bare spots in the grass by the highway. Usually it was by fresh water, but occasionally near alkali lakes, both full ones and dry ones. It never rested in the vegetation even though it might be found not far from it.

*Cicindela formosa*—gregarious—taken in Iowa, Nebraska, northern, southeastern and southwestern South Dakota, eastern Wyoming, northwestern Colorado, northern and southern North Dakota.

The first requisites for *formosa* are dry sand and vegetation. The presence of water is immaterial; it just happens that sand is often found along rivers. Except in southern Canada where,

inexplicably, no *formosa* was found in many seemingly typical habitats, almost every sandy place investigated, with or near loose sand and with plant cover to hide under, yielded *formosa*. Some such places were sandy paths in woods or prairie, sandy shores of rivers, sandy pastures, fields, and hillsides, sandy cuts along highways, and, above all, sand pits, dunes, blowouts or blowholes. Upon arrival at its habitat, you rarely see *formosa* until you have walked in and sufficiently disturbed the grass or willows or tumbleweed or sagebrush or sunflowers or poison ivy, or whatever the vegetation may be. Then you either catch sight of one running ahead of you through the weeds or you hear a loud buzz like that of a bumblebee and a *formosa* flies up and out onto the sand in the open. They do not usually fly very far and if given a chance, soon return to the cover of some plant.

This is eminently a sun-loving species. Near Towner, North Dakota, on a cool, cloudy day, we searched for a good half hour without stirring up a single one, but on our return to the same spot later, after the sun had come out, we found them right away. It is also a late riser and does not come out too early before the sand is warmed. For instance, at Mobridge, South Dakota, on a clear, sunny day without clouds of any kind, we began investigating a sand dune at 8 a.m. (there had been a light rain in the night and the sand was a bit damp). With both of us searching, it was 8:15 before one was seen. At 8:30 a second one was caught, running through thick weeds by the dune; at 8:45, one more. By 9:30 quite a few had been captured and after that, until 12:30, they were all over the dune, hunting, flying, and very active. In fact, 130 individuals were taken, even though so few at first.

Pairs, apparently mating, were taken in July.

*Cicindela fulgida*—gregarious—taken in eastern Nebraska, eastern and northern South Dakota, eastern and southwestern Wyoming, northeastern Montana, North Dakota, and southern Saskatchewan.

This beautiful species was always associated with alkali places and with vegetation. On the shores of alkali lakes, whether wet or dry, it would be found at the general border line of vegetation, among short sparse plants that spread out towards the lake

shore; on alkali flats or at saline spots by the highway, it was at the grassy edges of the small open areas, but in either situation it might also be farther back among the vegetation.

In many places, especially in the Dakotas, *fulgida* was taken far from any water and even when its habitat was near water, it stayed most often where the ground was dry and hard.

When pursued, *fulgida* usually ran quickly through the grass rather than take off into the open and when it did fly out, it did not go far and hurried back to cover. On a gray rainy day in Poplar, Montana, it was caught by hand and two were teased out of round holes in the ground. At this place there were numerous colonies of red ants, upon whose members *fulgida* was feeding.

A pair was seen in August.

*Cicindela hirticollis*—gregarious—taken in Iowa, central Nebraska, southwestern South Dakota, northeastern Utah, southwestern Wyoming, northwestern Montana, and northern and southern North Dakota.

*Cicindela hirticollis* was taken at all times on sand, almost invariably on river shores or sand bars, but sometimes around pools or moist places in sand pits. They were near the water's edge where the sand was damp, but spread out onto dry sand when disturbed. Thus, north of the Boar's Tusk Mountain, Wyoming, in a wild lonely area of miles of shifting sand hills, we found them all over the sand in the vicinity of moist places at the bases of the barren dunes. They were so swift and flew off so far up the sand slopes that we had to walk around them in wide circles to get them back down among some wiry grasses where they could be more readily caught. No other tiger beetle was found at this place.

Normally, *hirticollis* were not near vegetation but on one cloudy morning with some rain falling, they were found hiding among sparse plants along the Missouri River and near logs and debris.

Seen apparently mating in July.

*Cicindela lengi*—gregarious—taken in central Nebraska, southwestern South Dakota, eastern Wyoming, central North Dakota, and southern Alberta and southern Saskatchewan.



The ecological requirements of *C. lengi* seem to be identical with those of *formosa* and *scutellaris*. But an exceptional habitat was encountered at Lake Chaplin in Saskatchewan. This lake is extremely saline (sodium sulphate was being extracted from it) and has no sand on its shores. Two *lengi* were taken here, just before sunset among the short grasses at a gravelly patch about 300 feet from the water.

In the localities where *lengi* and *formosa* were both present, *lengi* was in far fewer numbers, but all through Canada, where only *lengi* was taken, it was very abundant.

Like *formosa* and *scutellaris*, *lengi* does not wander far from cover and when disturbed, flies a short distance only.

*Cicindela lepida*—gregarious—taken in western Iowa, central Nebraska, southwestern South Dakota, eastern Wyoming, and southern Saskatchewan.

Although seen occasionally in the daytime, *lepida* was always far more abundant at dusk or after dark, at which time it was taken by hand in the light of a lantern. Day or night, it was found on loose, dry, white sand away from vegetation, either on river sand banks or in sand blowouts. In the latter, it was more often on the sloping sides than at the bottom. The sand in some blowouts was so very fine and soft that even the feet of these "little ghosts" made tiny tracks in it.

Mating pairs were taken in June, July, and August.

*Cicindela limbalis*—not gregarious—taken in northeastern and southeastern Wyoming and northern North Dakota.

Solitary individuals of this species were always in close proximity of vegetation, usually in high altitudes, 5000 to 8500 feet, on stone, gravel or clay paths through pine woods. Two were taken by the sides of a small stream in Alva, Wyoming, but the rest were not found near water.

*Cicindela limbata*—gregarious—taken in central and western Nebraska, eastern Wyoming, southern Alberta and southern Saskatchewan.

Only once was this species found near water, on the shore of the Oldman River at Taber, Alberta, where a lone specimen was scooped up from hard packed sand, near the damp edge of the river. About 125 feet from the water was a five foot cliff of fine

loose sand, grown over by young willows, which may possibly have been its actual habitat. In other places, *limbata* was taken far from any moisture, on the bare sloping sides of sand blow-outs, or in sandy ditches or blowholes. Where they were quite numerous, they were found running through sparse vegetation or at its edges, but more often they were out in the open as in the case of *lepida*. They were more easily seen than the pale *lepida* because their metallic thorax glistened in the sun. Some were taken at dusk and a few at night by lantern light.

*Cicindela longilabris*—gregarious—taken in northwestern South Dakota, southeastern Wyoming, southern and northern Montana, northern and southern North Dakota, southern Alberta and Saskatchewan.

Throughout Canada and North Dakota, at relatively low altitudes (2000 to 3000 feet), almost any sparsely grassy place had a few *longilabris*. It might be the dry shore of an alkali lake, a saline spot by the road, an abandoned gravel pit, a sandy ditch, the side of a sand hill, a wheel track road or a path in the woods. It was found many times at the edges of gopher holes and was seen going into and coming out of them.

At 6000 and 8000 feet *longilabris* occurred on gravel or clay roads and on paths covered with pine needles in evergreen woods.

One cold grey morning in Banff, Canada, where they were definitely gregarious, they were picked up by hand from a sandy hillside, but when the sun came out and they became active, this technique had to be abandoned. Generally, they are quite elusive and fly long distances into the grass when disturbed, but surprisingly enough, even in full sunlight, occasional specimens let themselves be picked by hand on the edges of gopher holes.

*Cicindela macra*—gregarious—taken in Iowa, central Nebraska, and extreme southeastern South Dakota.

With one exception, *macra* was found close to the water where the soil was moist, on fresh water lake, river, or pool. At Elk Point, South Dakota, however, a single specimen was caught in the loose, dry sand of a shallow blowhole. The Missouri River, at this place, was  $1\frac{1}{2}$  miles distant, but there was some moisture in a swampy area about 200 yards away.

Large series were taken by hand at night, on river sand bars.

Before it was quite dark, the beetles would run from the moving lantern, but after 9:30 p.m., they came to it, usually stopping suddenly in the circle of light.

Seen apparently mating in July.

*Cicindela nevadica*—gregarious—taken in eastern and central Nebraska, eastern Wyoming, northeastern Montana, and southern Saskatchewan.

This species was found on the alkali or saline shores of lakes, rivers or stagnant pools where it preferred the wet borders, near or even in the water and usually not close to any vegetation. At night, however, it came out of the vegetation to light.

Two individuals were taken in slightly different habitats from the above: one at Halsey, Nebraska, on a river shore that seemed to have no evidence of alkali, and one near Alliance, Nebraska, on a dry dusty road between two alkali lakes whose shores had disappeared under rising water.

On a large alkali flat in Montana it was seen going in and out of cracks in the moist caked mud blocks around a pool.

Pairs were secured in July and August.

*Cicindela oregona*—gregarious—taken in southern, western, and northwestern Wyoming, northeastern Utah, western and northwestern Montana.

*Cicindela oregona* was always found close to water, usually on river shores, but on many different types of soil, gravelly or stony as well as on sandy or muddy, whether moist or dry. It ran generally in the open, occasionally near, though not in, the vegetation. Sometimes it occurred on a black sand with little flecks of white in it—a situation that made it nearly invisible. Though not as a rule partial to alkali, it was taken on two occasions on strongly alkali, gravelly soil and once, at Fort Bridger, Wyoming, on the slopes of alkali pools.

This species was found more often on gravel stony banks than any other species.

Apparently mating pairs were seen in July.

*Cicindela punctulata*—largely solitary—taken in all the states visited.

This is, very largely, a grass loving species, although it was also found in habitats of all kinds away from grass. It was the



only tiger beetle that came to electric lights in towns, but it was only once, at Hot Springs, South Dakota, attracted to a Coleman lantern.

When surprised in the vegetation, *punctulata* often clambered up on the grass stalks or low bushes. When caught, it gives off a fruity odor not encountered in any other species. It was seen apparently mating in August.

*Cicindela purpurea*—not gregarious—taken in eastern and western South Dakota, and northern and southeastern Wyoming.

Like *limbalis*, *purpurea* was quite solitary. The few specimens we took were in or near vegetation, or were flushed out of it onto open ground. They were thus found on river sand banks, at the back of the beach, on wheel track roads through grass or weeds, and in the short grass of saline spots by the highway. It was always found on dry soil.

*Cicindela pusilla*—not gregarious—taken in northern and southern Wyoming, northern Montana, northern and southern North Dakota, and southern Saskatchewan.

The main requirement for this species was grass or low plants, alternating with small open spaces. Individuals were often taken in alkali situations, such as the shores of alkali lakes, saline spots by the road, and alkali flats. At other times they were found on sandy, gravelly, or muddy river banks, on the sides of dirt roads, in grown over gravel pits, but always in or near vegetation. It evidently does not retire as early as some species as it was quite abundant at Bottineau, North Dakota, at 7 p.m., when the sun was quite low.

*Cicindela repanda*—gregarious—taken in every state visited.

In addition to being found near any kind of water, *repanda* was taken also far from water—in a sunken dry sandy ditch through a pasture, on a hard sandy road near weeds, and at the base of a sandy cut in the highway. It occurred most often, however, on river shores and bars, where it might be found about equally close to the water on damp ground, on the middle of the bar where the soil was dry, and among the willows and other vegetation at the shore line. It was taken on all types of soil.

On grey days there were always some *repanda* to be found, either in the open or among plants; at Ames, Iowa, it was taken

in the rain. On other occasions when a storm was coming or when the sun suddenly vanished, *repanda* began digging into the sand or hurried up the river bank into the vegetation.

Although we collected at night on a number of sand banks where *repanda* had been present during the day, only once, at Council Bluffs, Iowa, did it come to the light. Pairs were seen in July.

*Cicindela scutellaris*—gregarious—taken in Iowa, eastern and central Nebraska, eastern Wyoming, southeastern South Dakota, northern and southern North Dakota, and southern Alberta.

This species, like *formosa*, inhabits only dry sandy places either in or near vegetation. In fact, in every locality (except two) where it was found, *formosa* also was found. The converse, however, was not true, *formosa* being taken in twice as many localities and in twice the numbers. At Elk Point, South Dakota, where both species were abundant in a sandy pasture, it was noted that *scutellaris* was mostly in the grassier parts where there were only small bare spots, whereas *formosa* was in the open blowhole area where there were larger expanses of sand, and the vegetation was quite widely spaced. The Elk Point *scutellaris* were in thicker grass than is usual for them, which may be why, when startled, they climbed up on it, much as *punctulata* does.

Also like *formosa*, *scutellaris* stayed indoors when the sky was overcast. We never were able to find the former's retreats at such times, but on a cloudy day in Vermillion, South Dakota, we did dig out a number of *scutellaris* from their slit holes. One hole was under a thin clump of wiry grass, the others were at the edge of a sandy road bordered by tall golden rod. When the sun came out, so did the *scutellaris*.

A pair was seen apparently mating at the end of June.

*Cicindela sexguttata*—not gregarious—taken in Alva, Wyoming, only, on an open path in the pine woods at about 5500 feet.

*Cicindela togata*—gregarious—taken in Lincoln, Nebraska, only, in the same habitat as *circumpicta*. At night *togata* acted more nervously than *circumpicta* and ran around crazily in the light, sometimes even flying off into the darkness.

See correction  
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*Cicindela togata*—gregarious—taken in Lincoln, Nebraska, central Nebraska, South Dakota, western and southeastern Wyoming, northern Montana, North Dakota, southern Alberta and Saskatchewan.

Although often taken on sand, this species, throughout Canada, Montana, and North Dakota, was found almost entirely on saline spots by the road and on alkali flats or the shores of alkali lakes, in places frequented by *fulgida*. On dry lakes it preferred the grassy shore line, but, unlike *fulgida*, was often found out in the open.

In non-alkali places it was taken in sand dunes, on sandy roads and pastures, sandy cuts in the highway and on river shores, whether sandy, stony, gravelly, or muddy. It occurred about as often near or in the vegetation as away from it.

In three localities: Nanton, Alberta, Spring Lake and Belle Fourche, South Dakota, *tranquebarica* was the only species found and these places seemed hardly suitable for tiger beetles. The first two were the shores of reedy lakes, consisting of matted dry grasses with no bare soil showing, the third was on the cindery shore of a rapidly dwindling reservoir, about 200 feet from the water.

Twice, on rainy days, *tranquebarica* was dug out of its hiding places in the bare sand on river banks. Pairs, apparently mating, were taken in August.

*Cicindela willistoni*—gregarious—taken in southeastern and southwestern Wyoming, on dry alkali ground, at one time among clumps of grass in a seepage area below a reservoir, at another on saline mud among low sparse plants, about 50 to 75 feet from the water of a large alkali lake.